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Myxomycetes of Taiwan XVI. One New Species and One New Record of Physaraceae

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ABSTRACT: One new species and one new record in the family Physaraceae are described and illustrated by light and scanning electron microscopy. *Badhamia formosana* Liu and Chen sp. nov. was found on mosses that grew on barks of dead wood or on barks of living trees of broad leaves. This species is characterized by the stipitate, white and limy fruiting bodies, large spores and limy capillitium. Fruiting bodies of *Physarum braunianum*, a new record of Taiwan, were obtained from moist-chamber culture of leaf litters. They are easy to be recognized by the brownish orange-colored sporangia which are sessile and always constricted at base, and capillitium with angular lime nodes often in concolorous with the peridium.

KEY WORDS: ***Badhamia*, Myxomycete, Physaraceae, *Physarum*, Slime molds, Taiwan.**

INTRODUCTION

According to the literatures recorded (Chen and Liu, 1991; Chiang and Liu, 1991; Chung and Liu, 1996a, 1996b, 1996c, 1996d, 1996e, 1997a, 1997b, 1998; Chung *et al.* 1998; Chung and Tzean, 1998a, 1998b; Emoto, 1942; Liu, 1980, 1981, 1982, 1983, 1989, 1990; Liu and Chung, 1993; Liu and Chen, 1998a, 1998b, 1998c, 1999; Liu *et al.*, 2001, 2002; Nakazawa, 1929, 1931; Wang *et al.*, 1981; Wang and Chien, 1987; Wei and Liu, 1989) the total number of Myxomycetes that has been reported as found in Taiwan is about 206 species and 28 varieties. In this paper we report two additional species in the family Physaraceae. One of them is in the genus *Badhamia*, which is also an undescribed species of the world. The other one is in the genus *Physarum*. They were either collected from fields or harvested from moist-chamber cultures. As to the present, the number of taxa that has been known from Taiwan is 5 in the genus *Badhamia* (Liu, 1990; Nakazawa, 1929; Wang *et al.*, 1981) and 51 in the genus *Physarum* (Chen and Liu, 1991; Chiang and Liu, 1991; Chung and Liu, 1996b, 1996e, 1997a, 1997b; Chung and Tzean, 1998a, 1998b; Liu and Chung, 1993; Liu and Chen, 1998b, 1998c; Liu, 1980, 1982, 1989; Liu *et al.*, 2001; Nakazawa, 1929; Wang *et al.*, 1981; Wang and Chien, 1987; Wei and Liu, 1989). Their names are shown in table 1.

MATERIALS AND METHODS

Fruiting bodies and their microscopic structures were examined by light and scanning electron microscopy as described previously (Liu *et al.*, 2002). Characteristics were compared with other known species of *Badhamia* and *Physarum* that have characteristics close to our specimens (Martin and Alexopoulos, 1969; Nannanga-Bremekamp, 1991; Yamamoto, 1998).

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Table 1. List of Myxomycetes in the genera of *Badhamia* and *Physarum* in Taiwan.

Badhamia		
1. *B. affinis*	3. *B. macrocarpa*	5. *B. panicea*
2. *B. gracillis*	4. *B. nitens*	
Physarum		
1. *P. aeneum*	18. P. leucophaeum	35. P. polycephalum *var.* obrusseum
2. *P. alboradianum*	19. *P. leucopus*	36. *P. psittacinum*
3. *P. bivalve*	20. *P. melleum*	37. *P. pusillum*
4. *P. bogoriense*	21. *P. mutabile*	38. *P. retisporum*
5. *P. cinereum*	22. *P. nasuense*	39. *P. rigidum*
6. *P. compressum*	23. *P. nicaraguense*	40. *P. roseum*
7. *P. crateriforme*	24. *P. notabile*	41. *P. serpula*
8. *P. cremeiluteum*	25. *P. nucleatum*	42. *P. sessile*
9. *P. decipiens*	26. *P. nutans* var. *nutans*	43. *P. stellatum,*
10. *P. didermoides* var. *lividum*	27. *P. nutans* var. *rubrum*	44. *P. straminipes*
11. *P. echinosporum*	28. *P. oblatum*	45. P. superbum
12. *P. flavicomum*	29. *P. obpyriforme*	46. *P. taiwanianum*
13. *P. globuliferum*	30. *P. ovisporum*	47. *P. tenerum*
14. *P. gyrosum*	31. *P. penetrale*	48. *P. tessellatum*
15. *P. hongkongense*	32. *P. pezizoideum*	49. *P. vernum*
16. *P. laevisporum*	33. *P. plicatum*	50. *P. viride* var. *viride*
17. *P. lakanpalii*	34. *P. polycephalum* var. *polycephalum*	51. *P. viride* var. *aurantium*

RESULTS AND DICUSSION

Badhamia formosana Liu & Chen, **sp. nov.** Figs. 1-5, 11-14

Fructificationes gregariae, sporangiatae, stipitatae, rectae, 0.64-0.71 mm altitudinem totam. Sporangia turbinata, globosa sed subcompressa, vel reniformia, aliquando umbilicata ad partes inferioras, 0.33-0.51 mm diam., alba. Stipes erectus, subuliformis, albus, calcareus, 1-2 plo longior diametrum sporangii. Hypothallus albus, pluries inconspicuus vel nullus. Peridium cum albis granulis calcareis, dehiscentia petaloidea. Columella nulla. Capillitium abundum, reticulatum, calcareum, album, physaroides aliquantum, nodis calcareis, albis, angularibus. Sporae incumulo atro-brunneae, brunneae lucetransmissa, minute echinulatae vel verruculosae, globosae, subglobosae vel ellipticae, (11) 12-16 (aliquae 14×17) μm diam. Plasmodium ignotum.

Holotype: Taipei County: Wu-Lai, CHL B1271, Aug. 23, 1997, on mosses. In the Mycological Herbarium, Department of Botany, National Taiwan University.

Other specimens: Taipei City: NTU campus, CHL B83, Jun. 14, 1982, on bark of *Bischoffia javanica* Blume; CHL B228, Apr. 9, 1983, on bark; CHL B387, Jun. 8, 1984, on bark of *Bischoffia javanica*; CHL B1199-1, Jun. 19, 1997, on bark of *Cinnamomum camphora* (L.) J. Presl; CHL B1488, Apr. 28, 1998, on bark of *Bischoffia javanica*.

Etymology: The Latin word "formosana" refers to the beautiful island, Taiwan.

Distribution: Known only from Taiwan.

Fructifications gregarious, sporangiate, stipitate, erect, 0.64-0.71 mm in total height. Sporangia turbinate, globose, more or less depressed, or reniform, sometimes umbilicate below, white, 0.33-0.51 mm in diameter. Stalk cylindrical, subulate, white, limy throughout, 1-2 times as long as sporangial diameter. Hypothallus white, formed by lime granules extending from the base of stalk, often inconspicuous or lacking. Peridium membranous, densely covered with white lime granules, sometimes the lime granules forming fragmentary reticulation, dehiscing in a petaloid fashion. Columella absent. Capillitium abundant, netted, limy, white often somewhat physaroid with large angular lime nodes. Spores dark purplish brown in mass, brown (and becoming pale greenish brown in few hours) under transmitted light, minutely echinulate or warted with low warts, thus appearing smooth by the margins under high dry lens, globose, subglobose or slightly elliptical, (11-) 12-16 (some 14×17) μm in diameter. Plasmodium not observed.

This species is distinct in having stipitate, white, limy fruiting bodies and large spores which are close to that of *B. gracilis* in size but different in surface markings. In *B. gracilis*, the spores are angular in outline with well-defined ridges on the surface. The spores of *B. formosana* are globose or subglobose, echinulate or warted on the surface but it never has any ridges on its surface. The outer appearance of its fruiting body may look like that of *Physarum leucopus*, but it can be distinguished by its limy capillitial characters and its much larger spores. The white lime nodes in *Physarum leucopus* are connected by long hyaline threads. This species also resembles *B. macrocarpa* with regard to the color and shape of its sporangia and spores. But the sporangia in *B. macrocarpa* are either sessile or shortly stipitate with limeless stalks, characters which are never found in *B. formosana*.

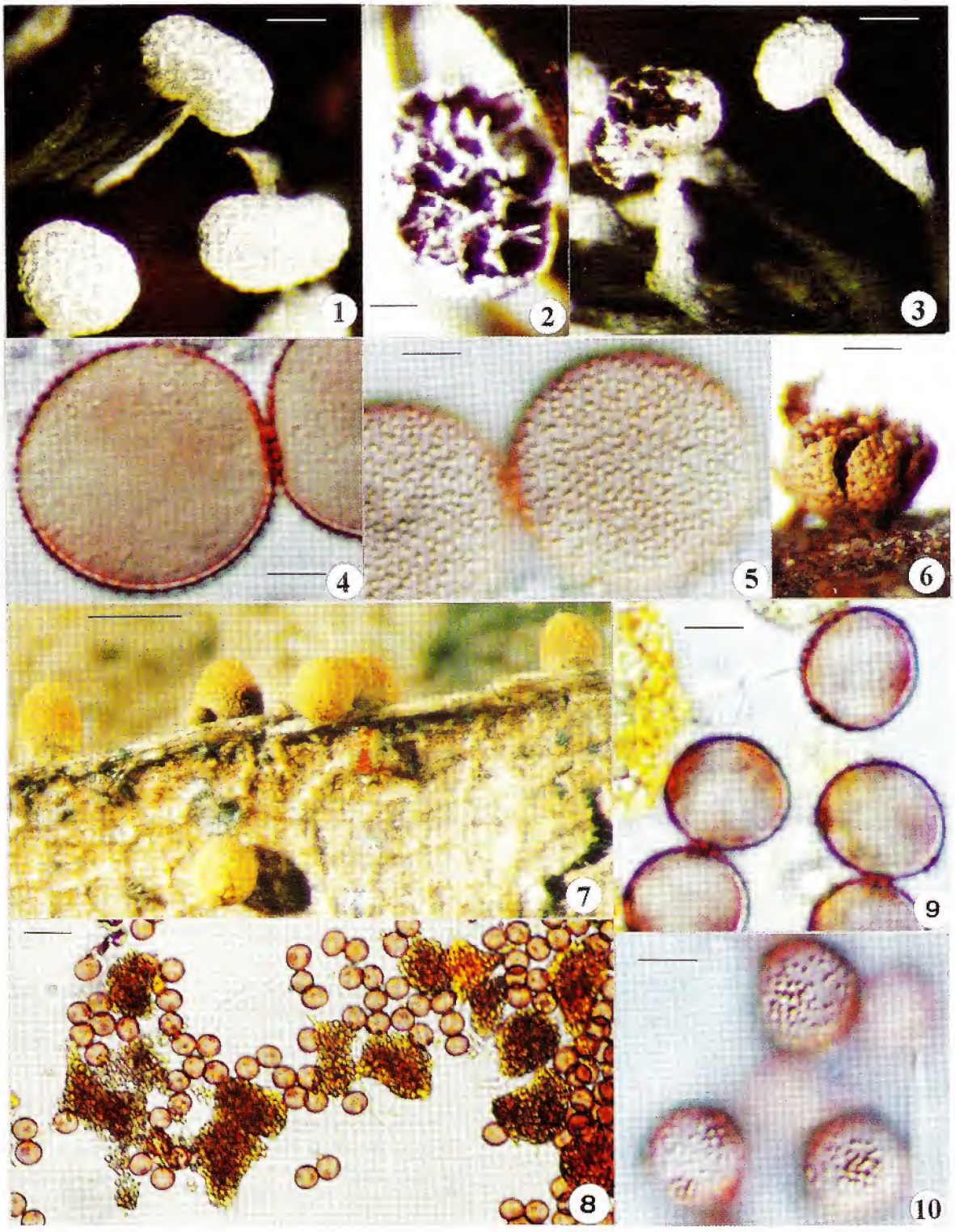
Physarum braunianum de Bary, in Rost., Mon. 105. 1874. Figs. 6-10, 15 & 16

Fructifications sporangiate, scattered to loosely gregarious, sessile, 0.20-0.39 mm in total height. Sporangia constricted at base, subglobose, erect-ovate, turbinate, or obpyriform; orange-yellow to brownish orange, 0.29-0.56 mm in diameter. Peridium membranous, translucent, covered often in dense manner by clusters of yellow or brownish orange lime granules, dehiscent from the top by forming angular fragments, or stellately. Hypothallus indistinct or lacking. Columella none. Capillitium dense, the node yellow, brownish orange or reddish, angular or branching, rounded in some, small or large and plump, 0.08-0.10 mm in diameter, connected by a network of hyaline threads. Spores dark brown in mass, purplish brown by transmitted light, globose, subglobose, or ovate, warted, sometimes bearing clusters of darker warts, 8-10 μm in diameter. Plasmodium not observed.

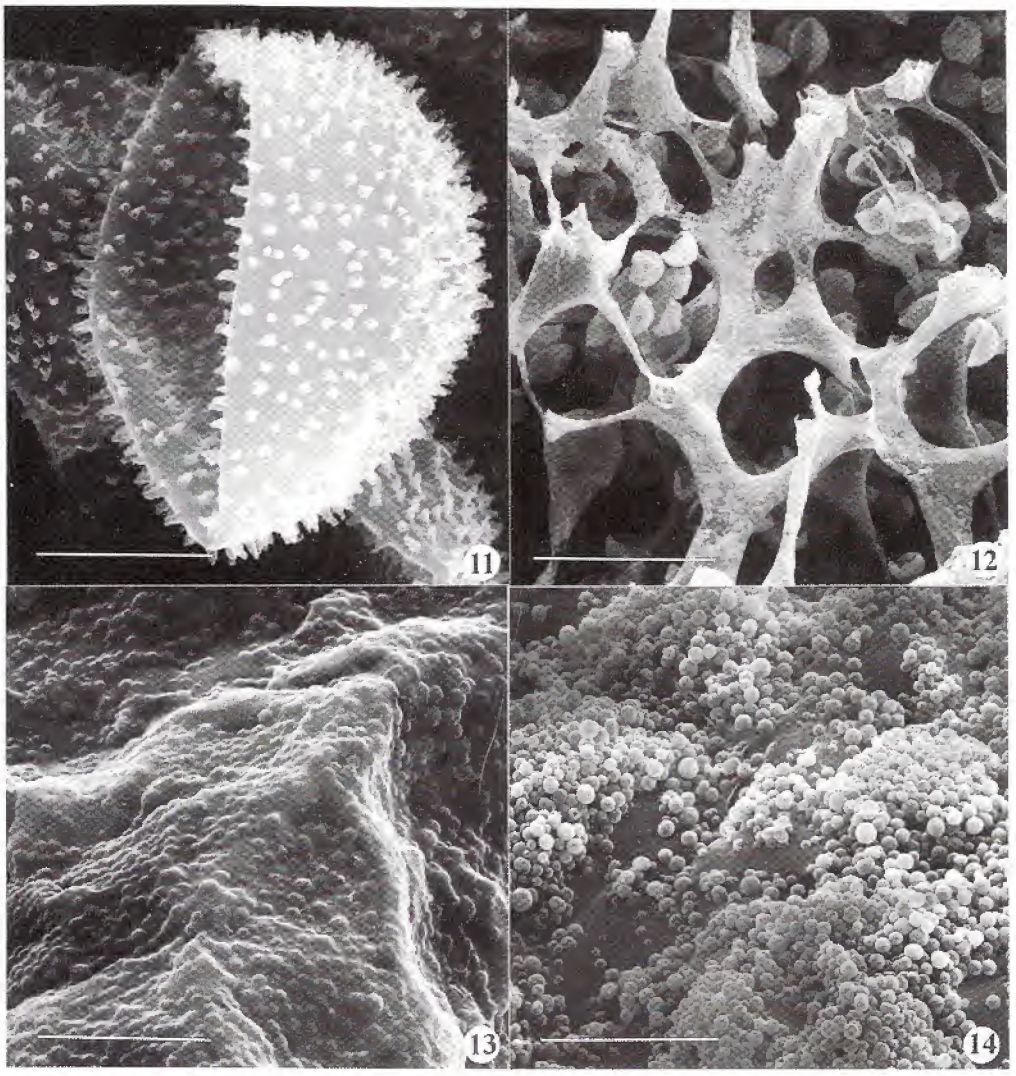
Specimen examined: Taipei county: Shih-ting, Wenshan Botanical Garden of National Taiwan Univ., Yang 99-8 B4L2, Jan. 5, 2000 (moist-chamber culture: 11/3/1999-1/5/2000), on leaf litter; Yang 2K-1 B5L1, Jan. 20, 2000 (moist-chamber culture), on leaf litter.

Distribution: Europe, Japan, North America, Oceania, Taiwan.

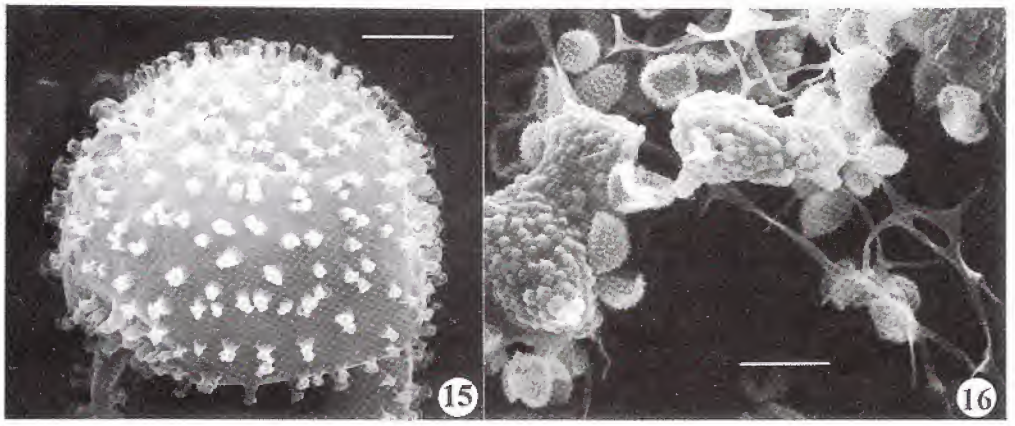
The specimens were obtained from moist-chamber cultures of leaf litters collected from summer through winter (August, October, and January) from a subtropical forest in northern Taiwan. Their fruiting bodies were not found in fields, probably due to the minute and sessile sporangia which are often scattered or loosely gregarious on the substratum. Nevertheless, the characteristics of the fruiting bodies are distinct: the sessile sporangia are mostly erect-ovate or obpyriform, brownish but closely speckled with brownish orange or paler lime clusters, and the angular lime nodes are yellow, brownish orange or even darker but reddish in color.



Figs. 1-5. *Badhamia formosana*. 1 & 3. Fruiting bodies, bar = 210 μm; 2. Top view of a dehiscent sporangium showing the white limy capillitium, bar = 100 μm; 4. Spores, marginal view, bar = 4 μm; 5. Spores, surface view, bar = 4 μm. Figs. 6-10. *Physarum braunianum*. 6. Sporangium dehiscent in petaloid fashion, bar = 200 μm; 7. Fruiting bodies, bar = 500 μm; 8. Capillitium, showing the lime nodes and the connecting threads, bar = 20 μm; 9. Spores, marginal view, bar = 5 μm; 10. Spores, surface view, bar = 5 μm.



Figs. 11-14. SEM of *Badhamia formosana*. 11. Spore, showing the surface markings, bar = 4 μm; 12. Limy capillitium and spores, bar = 45 μm; 13. Inner surface of peridium, bar = 10 μm; 14. Outer surface of peridium, bar = 10 um.



Figs. 15-16. SEM of *Physarum braunianum*. 15. Spore, showing the surface markings, bar = 1.5 μm; 16. Lime nodes and connecting threads of capillitium, bar = 10 μm.

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台灣黏菌(十六): 絨泡黏菌科的一新種及一新紀錄種

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摘　　要

本篇描述絨泡黏菌科的一個世界性新種及一個台灣新紀錄種，並加上光學和掃描式電子顯微鏡所拍攝的相片。台灣鈣絲黏菌 (*Badhamia formosana* Liu and Chen sp. nov.) 為一世界性新種，是在腐木樹皮上的蘚苔類植物或闊葉樹樹皮上所發現，此種黏菌的特徵是：子實體有柄，且覆有白色的石灰質顆粒，孢子大型和石灰質的細毛體。紅褐絨泡黏菌(*Physarum braunianum*)為台灣新紀錄種，是以枯枝落葉做濕室培養所得，其易辨認的特徵是：孢子囊呈橘褐色，無柄，其基部收縮，且細毛體的石灰節常和周膜色澤相近。

關鍵詞：鈣絲黏菌、真黏菌、絨泡黏菌科、絨泡黏菌、黏菌、台灣。

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